Resonance Analysis in the Region of Unresolved Resonances

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A statistical modeling of the resonant cross section structure in the unresolved resonance region has been proposed earlier by introducing the characteristic function of R-matrix elements distribution and a presentation of this by a ladder of fixed "resonances". The method of the characteristic function has been developed by using the Reich-Moore formalism for the case of non-fissile nuclei under the threshold for inelastic scattering.

An arbitrary cross section functional X can be considered as depending on K-function (K-matrix is determined in the level-matrix form of the collision matrix). The resonance averaging of X is performed by its presentation as a Laplace transform of corresponding original including the characteristic function of joint distribution density of the real and imaginary parts of K. The K-function is formed by using a hypothetical resonant cross sections structure in the energy averaging interval with a set of fixed N resonances.

In applications a resonance ladder with limited number for K-levels is used. This resonance structure's model is assumed with a periodicity to account for the contribution of K-levels that are outside the averaging interval. The parameters of model's ladder are determined by fitting the corresponding characteristic function to the statistical one for the wide variety of nuclei. The resonance averaged cross sections, their moments, average transmission and self-indication functions at arbitrary thickness n, are calculated by using this "resonances" ladder like it is in the resolved resonance region. These calculations are performed by the code HARFOR. An example is presented for calculation of resonance averaged cross sectional functionals.

The further development of the procedure for calculation of resonance averaged cross sections, transmission and self-indication functions is performed by including the inelastic scattering. The results of analysis of resonance neutron capture cross section energy structure near the first threshold of inelastic scattering are reported.

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